ESTIMATES OF CONSUMPTIVE USE AND GROUND-WATER RETURN FLOW AND THE EFFECT OF RISING AND SUSTAINED HIGH RIVER STAGE ON THE METHOD OF ESTIMATION IN CIBOLA VALLEY, ARIZONA AND CALIFORNIA, 1983 AND 1984

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ABSTRACT

In Cibola Valley, Arizona, water is pumped from the Colorado River to irrigate crops and to maintain wildlife habitat. Unused water percolates to the water table and, as ground water, moves downgradient into areas of phreatophytes, into a drainage ditch, out of the flood plain into the bordering terraces, and back to the river.

Consumptive use by vegetation is a component in a water budget to estimate ground-water return flow to the river from applied irrigation water. Evapotranspiration was used as an approximation for consumptive use by vegetation. Evapotranspiration was calculated as the sum of the products of the areas of vegetation types and the water-use rates by vegetation type. Evapotranspiration was estimated to be 70,100 acre-feet in 1983 and 62,600 acre-feet in 1984. These estimates may be in error because the effect of sustained inundation on the rate of water use by phreatophytes. The effects cannot be quantified and therefore adjustments to rates calculated for dry-surface conditions could not be made. In 1983 and 1984, ground-water return flow was negligible because in most of Cibola Valley the river lost water to the aquifer.

The method of estimating the consumptive use of water by vegetation and the ground-water return flow is affected by changing hydrologic conditions during years of rising and sustained high river stage caused by flood-control releases at Parker Dam. High river stage caused some areas to be flooded directly or raised ground-water levels above the land surface. No crops could be grown in flooded fields. The decreased depth to water and inundation with fresh water resulted in new phreatophyte growth in some areas. In some areas that were flooded, many phreatphytes died. Changes in the inundated and flooded areas throughout the years made it difficult to estimate evaporation losses from the increased water surface.

Changes in cropping patterns as a result of the Federal Payment-In-Kind Program affected the estimation of consumptive use by vegetation. The relation between evapotranspiration and consumptive use by vegetation in Palo Verde Valley, which was assumed to be transferrable for use in Cibola Valley in 1981, could not be transferred in 1983 and 1984. The relations between the two values in Palo Verde Valley were not the same in both years and the relations between the two values in Palo Verde and Parker Valleys-two valleys of similar size and crop mix-were not the same. Therefore, transferability of the Palo Verde Valley relation to a smaller valley with a different crop mix and a larger percentage of its area flooded was not appropriate.

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